PLANT SUPPORT ADAPTED FOR LIFTING AND CARRYING A PLANT CONTAINER

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the priority right of applicant's prior provisional applications serial nos. 60/459,640 filed April 3, 2003 and 60/472,788 filed May 23, 2003.

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

This invention relates to plant supports. More particularly the invention relates to plant supports of the kind that are used to support plants growing in plant pots or other similar plant containers.

2. BACKGROUND ART

Production of ornamental vines and trailing plants, juvenile woody ornamental plants, and vegetables in commercial greenhouses and nurseries requires the use of plant-stabilizing supports such as wooden, plastic or metal stakes, trellises, or cages. The main functions of the supports during the plant production stages are to: (a) contain the foliage and stems of plant growth, particularly of vines and trailing plants, within or around the support structures in order to maximize the number of pots that can be contained within a growing area, (b) support the vertical growth of plants to provide maximum rates of growth and development, (c) provide maximum exposure of foliage, flowers and fruits to sunlight, (d) enhance the visual appeal of plant growth forms, and (d) provide airflow through plant foliage to minimize the occurrence of diseases. The main post-production functions of plant supports are to provide stable structures to securely retain and contain plants during handling and shipping to prevent plant breakage and other damage.

A variety of materials are currently used as plant supports by the horticulture trade. For example, wooden stakes and bamboo poles are inserted into pots containing

growing mixes before or after planting, and then plants are tied to the supports with natural fiber or plastic materials. Alternatively, rigid plastic or fiberglass stakes can be used to provide vertical support for plant growth. Also, bare metal or plastic-coated metal wires or rods can be used as plant supports.

Numerous problems are commonly encountered with these types of supports. The stakes are not vertically stable when they are inserted into the growing mixes contained within pots i.e., they are easily knocked out or fall over during handling. This can cause significant plant damage. However, wooden and bamboo stakes can be securely fastened to the sides of pots by staples, nails or screws. Alternatively, they can be fastened by nailing, stapling or screwing, to wooden or bamboo horizontal supports which span the inside diameters of pots. The horizontal supports may also be secured to the sides of the pots by nailing, screwing or stapling. However, there are disadvantages associated with fastening wooden and bamboo stakes to pots. Significant time and effort are required to attach vertical stakes to the sides of pots or alternatively to horizontal braces which are then attached to the pots. Moreover, stakes which have been nailed, stapled or screwed to pots, or attached together and then attached to pots, are weakened at the attachment points and consequently, tend to be fragile, flimsy, and break at the attachment points unless handled with caution and care. Metal, plastic or fiberglass stakes can be securely fastened to sides of pots with plastic or metal ties inserted through holes drilled into the sides of pots. These steps are also time consuming and often do not securely retain the stakes in a vertical orientation. The consequence is that metal, plastic or fiberglass support stakes are frequently pulled out of pots during handling with consequent damage to plant material that they are supporting. Furthermore, the vertical supports used for commercial production of plants requiring support, are difficult for retail consumers to handle and remove when they are transplanting the plants into new containers or landscape settings. The plant supports often break during the customers' handling and transplanting activities resulting in significant plant damage. Plant damage also occurs during their removal from the plant supports. Customers commonly return damaged plants to the retail outlets for compensation and/or replacement resulting in significant business losses to both retailers and producers.

Numerous attempts have been made to improve the structural integrity of vertical plant supports within pots and in their attachment to pots. Examples include the welding of underground plates to metal vertical supports as disclosed in U.S. Patent No. 4,519,162, combination thermoplastic pot and support units in which the outer top circumference of thermoplastic pots contain receptacles into which the vertical thermoplastic supports can be inserted as disclosed in U.S. Patent No. 4,631,861, methods for securing supports to the sides of pots as described in U.S. Patent No. 4,270,310, and a foundation stake which clamps onto the side of a pot and into which additional plant-supporting stakes are inserted as described in U.S. Patent Application No. 2002/0073614A1. However, all of these examples lack the stability and structural integrity desired for horticultural production, handling and shipping of plants requiring vertical support. Furthermore, they are exceedingly complex and time-consuming to set-up and use before and during plant production.

It is common practice during commercial production of vines and trailing plants, to contain and support plant growth for extended periods of time during which plant height and plant mass will increase significantly. Accordingly, horizontal supports are commonly attached to vertical elements placed into plant pots in order to contain and support plants as they grow. Numerous devises have been developed to enable attachment of individual horizontal elements to vertical plant supports. These include systems which require insertion of the horizontal elements into holes pre-drilled into vertical supports as exemplified by US Patent Nos. 1,587,740, 1,627,495, and 2,764,846. Other systems incorporate devises which enable the horizontal supports to be locked onto or into a vertical support by means of compressive or gravitational pressure as exemplified by US Patent Nos. 2,851,823, 3,731,429 and 3,778,929. It is also possible to construct plant support systems that combine pre-drilled holes in vertical elements with compressive devises to secure horizontal elements as shown by US Patent No. 4,519,162. Alternatively, plant support and containment can be accomplished by the use of one-piece thermoplastic plant trellising systems which combine vertical and horizontal supports into one unit that can be snapped into thermoplastic pots (US Patent No. 4,631,861). However, all of these systems are complex to manufacture and furthermore, their set-up for

commercial horticultural use before and during plant growth is complicated and time-consuming.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a simple plant support system that is free-standing and vertically stable within a pot used for growing plants, and can structurally withstand the weight of plant mass, and handling and shipping stresses.

It is a further objective to provide a plant support system that does not have to be physically attached to the sides of plant containers, and will provide a stable and durable plant support during nursery production, handling and shipping.

It is another objective of this invention to provide a simple inexpensive plant support system with one or more de-mountable members that can be easily, quickly and firmly attached in a horizontal orientation to vertical plant supports to facilitate containment of plant mass and growth during nursery production.

It is yet another objective to provide a plant support system having one or more self-locking horizontal plant support members that will contain and provide stable support to vines and trailing plants during nursery production, handling and shipping.

According to one aspect of the present invention, there is provided a plant support system for use with an open-topped plant container for a growing plant, the plant support comprising: a vertical plant support member and an anchor member each made of a stiff material, the plant support member and the anchor member being rigidly and permanently attached to each other; the plant support member being capable of generally vertical orientation and having a lower end adapted in use to extend to a bottom of the plant container filled with a mass of plant growth medium, an upper end remote from the lower end, and a part that is grippable by hand adjacent to the upper end; and the anchor member being attached to the plant support member at the lower end thereof and comprising a base element extending generally horizontally when the plant support member is orientated generally vertically, whereby the base element may be positioned beneath the mass of growth medium in

the container with the plant support member extending vertically from the mass of growth medium to facilitate support of a plant growing in the mass, and to facilitate lifting and transportation of the container filled with the mass of growth medium via the part of the plant support member that is grippable by hand.

According to another aspect of the present invention, there is provided a plant support for use with an open-topped plant container for a growing plant, the plant support comprising: a vertical plant support member made of a stiff material, the vertical member having at least two uprights integrally connected to an anchor member, each upright including confronting inwardly facing surfaces and opposite outwardly facing surfaces; a horizontal plant support member comprising: a first loop made of a stiff resilient material having engagement surfaces spaced around the loop adapted for simultaneously engaging the confronting inner surfaces of the uprights; and a second loop made of a stiff resilient material having engagement surfaces spaced around the loop adapted for simultaneously engaging the opposite outer surfaces of the uprights; at least one of the first loop and the second loop having projections incorporating the engagement surfaces formed by bends in the loops such that, in use, the loops overlie each other at the projections adjacent the uprights; whereby, when positioned on the vertical support, the horizontal plant support is held in place by engagement of the uprights between the first and second loops.

According to another aspect of the invention, there is provided a plant support, comprising: a vertical support having at least two uprights, each upright including confronting inwardly facing surfaces and opposite outwardly facing surfaces; and a horizontal support attached to the vertical support; wherein the horizontal support comprises: a first loop made of a stiff material having engagement surfaces spaced around the loop for simultaneously engaging the confronting inner surfaces of the uprights; and a second loop made of a stiff material having engagement surfaces spaced around the loop for simultaneously engaging the opposite outer surfaces of the uprights; at least one of the first loop and the second loop having projections incorporating the engagement surfaces formed by bends in the loops such that the loops overlie each other at the projections adjacent the uprights; whereby the

horizontal support is held in place on the vertical support by engagement of the uprights between the first and second loops.

By the term "engage" or "engagement" I generally mean contact with sufficient force or pressure to grip (with enough friction to resist, although not necessarily prevent, slippage) in use.

According to another aspect of the invention, there is provided a horizontal plant support for attachment to a vertical plant support having at least two uprights; the horizontal plant support comprising: a loop having a peripheral shape adapted to provide horizontal support for a plant, the loop being made of a material that is resiliently flexible and springs back to an original shape when flexed, and the loop having at least two engagement sections spaced around the loop, each engagement section being adapted to receive and engage a different one of the uprights; wherein each engagement section is formed by a part of the loop bent out of the peripheral shape of the loop to form a re-entrant clamp that enlarges and opens when the loop is flexed, and that contracts and closes when the loop is released, thereby enabling the support to be installed on the uprights when the loop is flexed to open and enlarge the clamps to receive the uprights, and to be supported on the uprights by the clamps when the loop is released.

By the term "re-entrant clamp" I mean a part of the loop that is bent back on itself to form a V-shaped, U-shaped, curved or similar element providing with a spacing between adjacent parts of the loop that in the released form of the loop, is preferably smaller than the width of an upright that will be received by the clamp.

Preferably, the parts of the loop forming the engagement sections are bent into the shape of a figure eight comprising two circles, a circle most distant from the loop forming the re-entrant clamp, and a circle closest to the loop formed by overlapping curves of the rod that move apart when the loop is flexed, thereby allowing an upright to enter the clamp, but preventing exit of the upright from the clamp when the loop is released and the curves return to an overlapping condition.

According to another preferred aspect of the invention, there is provided a combination comprising an open-topped plant container and a plant support, the open-

topped container having sidewalls, a bottom and an open top, and containing a mass of growth medium, and the plant support comprising: a plant support member and an anchor member each made of a stiff material, the plant support member and the anchor member being rigidly and permanently attached to each other; the plant support member being orientated and having a lower end extending to the bottom of the plant container, an upper end separated from the lower end by a distance causing the support member to clear the open top, and a part that is grippable by hand adjacent to the upper end; and the anchor member being attached to the plant support member at the lower end thereof and comprising a base element extending generally horizontally when the plant support member is orientated generally vertically, the base element being positioned beneath the mass of growth medium in the container with the plant support member extending vertically from the mass of growth medium to facilitate support of a plant growing in the mass, and to facilitate lifting and transportation of the container filled with the mass of growth medium via the part of the plant support member that is grippable by hand.

According to yet another aspect of the invention, there is provided a plant support, comprising: a vertical support having at least two uprights, and a horizontal support attached to the vertical support; wherein the horizontal support comprises: a loop having a peripheral shape adapted to provide horizontal support for a plant, the loop being made of a material that is resiliently flexible and springs back to an original shape when flexed, and the loop having at least two engagement sections spaced around the loop, each engagement section receiving and engaging a different one of the uprights; wherein each engagement section is formed by a part of the loop bent out of the peripheral shape of the loop to form a re-entrant clamp that enlarges and opens when the loop is flexed, and that contracts and closes when the loop is released, thereby enabling the support to be installed on the uprights when the loop is flexed to open and enlarge the clamps to receive the uprights, and to be supported on the uprights by the clamps when the loop is released.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of one embodiment of the invention showing a plant support with two vertical elements;

Figure 2 is a vertical cross-section of a combination of the plant support of Fig. 1 positioned in a plant container which has been filled with mass of growth medium;

Figure 3 is a perspective view of a second embodiment of the plant support of the invention provided with one vertical element;

Figure 4 is a partial perspective view of a plant support provided with horizontal notches placed onto the vertical elements so that horizontal elements can be attached, and to facilitate severing of the vertical elements if so desired;

Figure 5 is a perspective view of a third embodiment of the invention based on the plant support shown in Fig. 1 where in horizontal elements are permanently affixed to the vertical elements;

Figure 6 is a perspective view of a fourth embodiment of the invention based on the plant support shown in Fig. 3 wherein area of plant support is expanded by the permanent attachment of a rectangular-shaped element to the single vertical element;

Figure 7 is a top plan view of a fifth embodiment of the invention showing a two-ring horizontal support in position on a vertical support having two uprights;

Figure 8 is a perspective view of the embodiment of Figure 7 showing the positioning of the rings on the upright support;

Figure 9 is an enlarged partial view of the embodiment of Figure 8, partially in cross-section, of the region where the horizontal support contacts the vertical support;

Figure 10 is a plan view of an alternative embodiment of a horizontal support of the invention; and

Figure 11 is a perspective view of the embodiment of Fig. 10 showing the horizontal support in place on a vertical plant support.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 of the accompanying drawings shows a first preferred embodiment of the plant support system of the present invention. The plant support 10 has a plant support member 12 and an anchor member 14. The plant support member 12 and the anchor member 14 are rigidly and preferably permanently attached to each other by virtue of their formation from a single loop of preferably rod-like stiff material 16. Fig. 1 shows the device in the orientation in which it is normally used, i.e. with the plant support member 12 having a generally vertical orientation and the anchor member 14 extending generally horizontally. The rod-like stiff material used for the support may be any suitable material such as, for example, metal wire, plastic-coated metal wire, metal rod, plastic-coated metal rod, molded plastic rod and molded fiberglass rod. Furthermore, the cross-section of the rod-like material may be of any suitable shape, for example, round, elliptical, square, rectangular or multi-faceted.

The anchor member 14 comprises a base element in the form of a non-linear rod in the form of an open flat loop 20 that projects from the lower end 22 of the plant support 10 by a distance preferably of at least 2.54 cm (1 inch) and more preferably at least 5.08 cm (2 inches). The loop 20 may be made by bending a linear rod of the material and joining the free ends together. The free ends of the loop can be permanently joined by means such as, but not restricted to, welding, gluing, clamping one end onto the other, or other means as appropriate to the material selected.

The upper end 23 of the plant support 10 has a part 24 that is that is grippable by hand. In this embodiment, this part takes the form of a part of the metal loop incorporating a cross-piece or connecting rod 26 adjacent to the upper end of the support. Thus, the plant support member 12 consists of two generally straight vertical rods 28 and 30 connected together at the upper end of the member by a single horizontal cross-piece 26. The cross-piece 26 may be gripped in one hand like a handle.

The plant supports encompassed by this embodiment can be made from a length of material selected from one of but not restricted to, metal wire or rods, plastic-coated metal wire or rods, thermoplastic rods, fiberglass rods, and other suitable materials. Furthermore, the cross-sectional shape of the material can be

round, elliptical, square, rectangular or multi-faceted. The two ends of the plant support so formed can be permanently joined by means such as but not restricted to welding, gluing, clamping one end onto the other, or other means as appropriate to the material selected.

Fig. 2 shows a combination of the plant support of Fig. 1 in position in an open-topped plant container 40 filled with a plant growth medium 42. The plant growth medium may be any conventional soil or growing mix and usually consists of a heterogeneous mixture of solid particles, moisture (i.e. liquid) and airspace. The medium may be quite loose to fairly compact depending on the choice of medium and the degree of cohesion caused by plant roots and organic contents. The plant container 40 may be a conventional plant pot preferably made of plastics material that is of relatively light weight. Ideally, the weight of the container 40 should be less than that of the mass of the plant growth medium 42 when the container is filled to the normal height. Conventional containers made of plastics material normally meet this preferred weight ratio. The container has a sidewall 44, an open top 46 and a bottom 48. The container may be of circular cross-section, but other shapes could be employed, e.g. square or rectangular, octagonal, etc.

The plant support 10 is arranged in the container 40 so that the lower end 22 of the plant support member 12 extends to and is free-standing on the bottom 48 of the container. The upper end 23 of the plant support member 12 extends vertically from the container to act as a support to facilitate support of a plant (not shown) growing in the mass 42. The plant may be attached to vertical rods 28 and 30 by means of conventional ties (not shown). The anchor member 14 extends along or near the bottom 48 of the container beneath the mass of growth medium 42.

The support 10 may be introduced into the container 40 before the mass 42 of growth medium is added and the plant planted therein, or it may be introduced afterwards, e.g. by inverting the container while holding the mass 42, gently removing the mass (with any plant therein) from the container, inserting the support 10, re-inserting the mass 42 and re-inverting the container. In this case, the mass of growth medium remains sufficiently cohesive, especially if bound together by plant roots, that it does not disintegrate during this operation.

It is to be noted that, in the present invention, it is not necessary or desirable to physically attach the plant support to the plant container. The generally horizontal anchor member 14 not only helps to stabilize the free-standing support 10 in the container 40, thus making it more stable for support of a plant, but remarkably makes it possible to lift the container, including the contents, by grasping the grippable part 24 of the support and using this to lift the entire unit even though the plant support is free-standing within and not in any way attached to the container. The anchor part 14 prevents the support member 12 form being pulled out of the mass of growth medium 42 by virtue of its position underneath and its engagement with the mass. However, the container 40 remains in place around the mass of growth medium when the support 10 is lifted thus the combination of container, growth medium (with plant, if any) and support 10 remains together. The container may therefore be lifted and transported using part of the plant support 10 as a handle. Most surprisingly, the plant support 10 can be used in this way even if the mass 42 of plant growth material is only loosely compacted and even if there is no root ball from a plant. It is usually only necessary to use one hand to lift the plant container and its contents so that it can be moved from place to place.

In order to prevent accidental separation of the container from the mass of growth medium, the anchor member 14 must extend beneath the mass to a suitable extent. As noted, this means that the horizontal extent of the anchor member should normally be at least 2.54 cm (1 inch), and more preferably at least 5.08 cm (2 inches). However, the preferred extent depends to some extent on the size of the container. In general terms, therefore, the horizontal extent of the anchor member should preferably be at least 20% of the diameter of the container. Preferably, also, the container should not be too heavy, e.g. as noted, it should preferably have a weight that is less than the weight of the mass of growth medium. If the container is not circular at the bottom, the horizontal extent of the anchor member should preferably be at least 20% of the smallest dimension of the container at the bottom.

A second embodiment of this invention is shown in Fig. 3. In this embodiment, a plant support 10' has a plant support member 12' consisting of a single vertical element 28' conjoined to a generally horizontal anchor member 14' with a 90°

bend.. The anchor member 14' in this embodiment is formed of a elongated non-linear member 18' twisted into an open loop 20' as shown.. The loop 20' preferably extends only on one side of the vertical element 28' as shown, but it may alternatively partially or completely encircle lower end 22' of the plant support member 12'. In this embodiment, any part of the vertical element 28' that, in use, extends above a mass of growth medium of the type shown in Fig. 2 may form a part that is grippable by hand. The only requirement is that the part of the rod extending above the mass of growth medium be sufficiently long that it can comfortably fit within the closed fist of the user, while also being long enough to act as an effective plant support. Ideally, but not essentially, this part of the vertical element should be longer than the predictable height of the plant with which the support is intended to be used (at least in the early growth stages of the plant), so that the upper end 23' of the vertical element 28' extends above the plant matter, thus allowing easy access for grasping by the user. As in the previous embodiment, the plant supports encompassed by this embodiment can be made from a number of materials including but not restricted to metal, plastic-coated metal, thermoplastic rods, fiberglass rods, and other suitable materials. The only requirement is that the material be stiff enough for the support to provide an effective supporting function for a plant and strong enough to allow lifting of the container, plant and mass of plant growth medium while being graspable by hand.

The horizontal extent of the anchor member 14' should preferably be sized to fit into different pot diameters such that the anchor member extends over at least 20%, and more preferably between 50-100% of inside diameter of the plant container at the bottom thereof. However, it is preferred that the anchor member extend over 50-75% of the inside diameter of the plant container at the bottom thereof. If the container is not circular at the bottom, the horizontal extent of the anchor member should preferably be at least 20% of the smallest dimension of the container at the bottom.

A further preferred embodiment of the invention is shown in Fig. 4. This embodiment of this invention is similar to that of Fig. 1 except for the provision of horizontal notches 50 in the vertical elements 28 (only one being shown in Fig. 4) that are indented into the vertical elements at regular intervals, for example intervals spaced in a range of 5.0 – 30.5 cm (2 – 12 inches) apart. Furthermore, the regular

spacing of the horizontal notches can be scaled to the diameter of the pot in which the plant support will be placed; that is, the smaller the diameter of the pot, the closer the spacing between the notches. The notches can be utilized for a number of commercially useful purposes including but not restricted to: (a) securing plant sections to the support by means of tying a plant tie around the notch, then encompassing the plant parts to be supported and tying the two ends of the tie together, (b) attaching and securing separate horizontal plant supports into and through which the plant will grow and develop, and (c) facilitating the severing of the vertical elements with an appropriate cutting tool such but not restricted to side-cutters and pliers.

Another embodiment of this invention is the provision and expansion of a flat growing surface for trailing plants, vines and other such plant material, by modification of the embodiment exemplified in Fig. 1 and shown in Fig. 5 by means of permanent attachment of horizontal elements 60 to the vertical elements as 28, 30 at points 61. The materials selected for the horizontal elements 60 should preferably be the same as the materials used for the vertical elements 28, 30 and the means of permanently attaching horizontal elements to the vertical elements should be appropriate to those materials, e.g., welding for metals and gluing for plastics.

Yet another embodiment of this invention is the provision and expansion of a flat growing surface for trailing plants, vines and other such plant material, by modification of the embodiment exemplified in Fig. 3 and shown in Fig. 6 by means of permanent attachment of a rectangular element 70 to the vertical element 28 at points 61. The materials selected for the horizontal elements 70 should preferably be the same as the materials used for the vertical elements 28, and the means of permanently attaching horizontal elements to the vertical elements should be appropriate to those materials, e.g., welding for metals and gluing for plastics.

Furthermore, it is to be noted that all of the above described embodiments can be produced in a manner which will facilitate their removal from the plants they are supporting with a minimum or no plant damage when the plants are removed from their containers and transplanted into other containers or into landscapes. Specifically, indentations can be stamped or molded into the vertical and horizontal elements on

and within which plant growth will occur, thereby facilitating severing the elements by means of a cutting tool such as but not restricted to wire cutters and pliers so that the elements can be easily slid away from the plant material.

It is desirable during commercial production of trailing plants and vines, to contain the plant mass within the outer perimeter of the pots in which they are grown in order to maximize packing densities and to minimize plant damage during handling and shipping. One form of the present invention suitable for containing the plant mass of a trailing plant or vine within the perimeter of a pot (not shown), is illustrated in Figs. 7, 8 and 9. In this embodiment, the support consists of a vertical support 110 and a horizontal support 112. The horizontal support 112 by itself also forms an embodiment of this invention.

The vertical support 110 has two uprights 114 and 115 joined at the top by a cross-piece 116. The uprights 114 and 115 are inserted at their lower ends 114A and 115A into the soil of a plant container, such as a conventional plant pot (not shown), to a depth suitable to allow the vertical support to stand freely and firmly within the container. If so desired, the lower ends may be attached to an anchor member as described in the previous embodiments, but this is not essential in this form of the invention. The uprights 114 and 115 themselves act as supports and guides for plants as they grow in the soil of the container. The uprights each have an external surface that is notionally divided into an inner surface (114B and 115B - See Fig. 9) which confront or face each other, and an opposite outer surface (114C and 115C) that face away from each other (see Fig. 9).

The horizontal plant support 112 is releasably attached to the vertical plants support 110 at a position somewhere between the lower ends 114A and 115A and the cross-piece 116, as shown. The function of this support is to provide more surface area to guide and support the growing plant and/or to contain the horizontal spread of the plant as it grows (this allows more plants to be assembled in a given area than if the plants were allowed to spread out horizontally without limitation). If desired, more than one horizontal plant support may be positioned on the vertical plants support at vertically spaced positions, but just one such support is usually enough.

The horizontal plant support comprises a first rod 117 of stiff material (preferably metal wire or a tough plastic) formed into a first loop 118 and a second rod 119 of stiff material (preferably metal wire or a tough plastic) formed into a second loop 120. The loops may be of any shape, but are preferably generally circular as shown. The loops are preferably continuous, but may be interrupted at a point around the periphery, if required. The first loop 118, while generally circular, has projections 121 and 122 formed by bends in the rod 117. The projections are directed inwardly of the loop 118 (thus forming indentations) and are of V-shape as shown. Each projection 121 and 122 has an apex 121A and 122A (see Fig. 9) where the arms of the "V" join together. The surfaces on the inward bend at the apices form engagement surfaces 121B and 122B that contact and engage the inner surfaces 114B and 115B of the uprights 114 and 115. Preferably, the rod 117 from which the loop 118 is made is somewhat resilient and springy, i.e. it rebounds when flexed. In this way, the distance between the engagement surfaces 121B and 122B prior to installation of loop 118 on the vertical support 110, can be made slightly more than the distance X between the inner surfaces 114B and 115B of the of the uprights 114 and 115. The reason for this will be explained below.

The second loop 120 is preferably circular and has no projections. The loop has engagement surfaces 120A and 120B (see Fig. 9) which contact and engage the outer surfaces 114C and 115C of the uprights 114 and 115. The rod 119 which forms the loop 120 is also preferably made of a somewhat resilient springy material so that it rebounds when flexed. The distance separating the surfaces 120A and 120B, prior to installation of the horizontal support 112 on the vertical support 110, is preferably slightly less than the distance Y separating the outer surfaces 114C and 115C of the uprights 114 and 115 for the reason explained below.

In this embodiment at least, the loops 118 and 120 are not attached together, although they do overlie and preferably contact each other, at the projections 121 and 122, as shown in Figs. 7 and 9. However, the two loops cooperate and function together as well as with the vertical support, and two loops together form the horizontal support 112.

The horizontal support 112 can be installed on the vertical support 110 in the following manner. The first loop 118 is held at an angle to the horizontal and positioned between the uprights 114 and 115 with the inward projections 121 and 122 roughly aligned with the uprights. The loop is then twisted to the horizontal position. As this is done, the inward projections 114 and 115 receive the uprights and guide the engaging surfaces 121A and 122A into contact with the inner surfaces 114B and 115B of the uprights. Although the distance between the engaging surfaces is slightly greater than the distance between the inner surfaces of the uprights, the loop 118 can nevertheless be twisted to the fully horizontal position by virtue of either flexing of the loop or slight outward bowing of the uprights, or both. The second loop 120 is then held horizontally and is inserted over the top of the vertical support 110 and slid down to the position of the loop 118. Although the inner diameter of the loop 120 may be slightly less than the distance between the outer surfaces 114C and 115C of the uprights 114 and 115, the loop can still be drawn over and slid down the vertical support 110 by flexing of the loop or a slight inward bowing of the uprights (at least in positions spaced from the cross-piece 116). The loop 120 is slid down as far as possible over the vertical support and is preferably brought into direct contact with the first loop 118 at the inward projections 121 and 122 immediately adjacent to the uprights 114 and 115.

While the horizontal support 112 can be easily installed, and if required, removed in this way, it is held in a very secure manner on the vertical support 110. The uprights are securely gripped by the engagement surfaces of the first and second loops. The engagement surfaces of the first loop urge the uprights apart, and the engagement surfaces of the second loop urge the uprights together. The uprights are thus held immobile in the region of the horizontal support and firmly in contact with the first and second loops. The second loop is supported against being moved downwardly or twisted by virtue of the overlap, and preferably contact, with the first loop.

If the material of the uprights is compressible, the engagement surfaces of the loops may compress the uprights at the points of engagement, thus embedding the loops into the uprights to some extent making the positioning of the loops even more

secure. This may occur if the uprights are made, for example, from stiff but slightly compressible plastics material. If the uprights are made of metal, e.g. metal wire, they may have little compressibility and the differences in spacings of the engagement surfaces of the loops and the surfaces of the uprights are accommodated entirely by the flexibility of the loops. The attachment of the loops to the uprights may then rely entirely on the friction that is generated between the loops and the uprights. In such cases, to make the attachment even more secure, one or preferably both uprights 114 and 115 may be provided with horizontally aligned vertically spaced grooves 125 (Fig. 8) on the inner surfaces 114B and 115B. These grooves 125 may be of such a width as to partially receive the engagement surface 121A and 122A. The first loop 118 can thus be "locked" in position on the uprights 114 and 115. The positioning of the second loop then prevents the engagement surfaces of the first loop from slipping out of the grooves 125.

As noted above, the loops should preferably be dimensioned such that the distances between the engagements surfaces should be more (in the case of the first loop) or less (in the case of the second loop) than the distances between the surfaces of the uprights that they engage. This provides a good degree of gripping of the uprights by the loops due to the tendency of the loops to rebound when flexed to accommodate the differences in distance. However, the differences in distance do not have to be great and could in fact be none-existent (in which case the loops contact the uprights without significant pressure or force, but still generate friction sufficient to hold the loops in place). If too great, the differences in distance require substantial deformation of the loops for proper installation and, depending on the material of the loops, could cause deformation beyond the point of full rebound, thus causing permanent deformation that reduces or eliminates the ability of the loops to grip the uprights. For the most common materials (e.g. metal wire) the differences in the distance may preferably range up to 10%, more preferably up to 5% and ideally no more than about 3%.

While the illustrated embodiment is designed for use with a vertical support having two uprights, it will be apparent that changes can easily be made to accommodate a vertical support having three or more uprights. In such a case, one or

more additional inward projections similar to 121 and 122 are provided and all of the projections are positioned to correspond to the positions of the uprights. The loops are then installed in the same way as indicated above.

The horizontal supports provide firm horizontal growing areas for trailing plants to expand and grow. They can also provide a boundary for plants that grow upright in order to prevent such plants from spreading outwardly or being bent over and damaged. If desired, more than one horizontal support may be positioned on a single vertical support.

Another form of the invention is illustrated in Figs. 10 and 11 of the accompanying drawings. Fig. 10 is a plan view of a horizontal plant support 212 in which a rod 217 of flexible material and resilient springy material, e.g. metal wire or plastics, is formed into a loop 218 having an outer shape, in this case generally circular, that is suitable for supporting a plant or restraining a plant from spreading outwardly. The horizontal support is intended for attachment to a vertical support 210 (see Fig. 11) having two uprights 214 and 215 and has two engagement sections 221 and 222 for engaging the uprights 214 and 215 so that the horizontal support is positioned on and supported by the vertical support.

Each engagement section 221 and 222 is formed by parts of the rod bent into the shape of a figure eight as shown, each made up of two circles. The circles 230, 231 most distant from the loop 218 form circular re-entrant clamps for the uprights 214 and 215. The circles 233 and 234 closest to the loop 218 are formed by overlapping curves 233A, 233B and 234A, 234B of the rod that overlap and yet move apart when the loop is flexed, e.g. when opposite parts of the loop are grasped in opposite hands and pulled away from each other. When this is done, the clamps 230, 231 enlarge and open so that the clamps can be positioned on the supports 214 and 215 . When this is done and the flexing is stopped, the curves 233A, 233B or 234A, 234B return to their overlapped condition, thus preventing exit of the uprights 214 or 215 from the clamps 230, 231. The internal dimensions of the clamps (the diameters when the clamps are circular) are chosen to be slightly smaller than the outer dimensions of the rods 214, 215 so that the clamps grip the rods and attach the horizontal support firmly to the vertical support by the resultant friction. If the

uprights are compressible, the clamps may compress the supports and thus create a more positive attachment. If the uprights are not compressible, the clamps do not fully return to their original shape and engage the outer surfaces of the uprights with continuing force or pressure.

Preferably, the rods 214, 215 are provided with horizontal grooves 225 at vertical spaced positions (Fig. 11). When the clamps 230, 231 are located at one of these positions, the part of the rod forming the clamp may partially enter the grooves 225, thereby creating a more positive locking of the horizontal support on the vertical support.

If desired, the horizontal support 212 may be removed from the vertical support 210 by once again gripping the loop 218 in both hands and pulling outwardly to move the curves 233A, 233B and 234A, 234B out of the overlapping position, and to expand the clamps 230 and 231, thereby allowing the clamps to be disengaged from the supports. Pulling the curves apart to a lesser extent allows the clamps to be released from the uprights but not removed therefrom, so that the horizontal support may be moved up or down along the uprights 214 and 215 to reposition the horizontal support.

As with the previous embodiment of the invention, the horizontal support can be modified to be used with a vertical plant support having three or more uprights. To do this, more engagement sections are provided to match the number of uprights and the positions of the engagement sections around the loop are also chosen to match the positions of the uprights.

While this invention has been described with respect to the preferred embodiments, it is to be understood that various alterations and modifications can be made to the vertical and horizontal elements of the plant supporting device within the scope of this invention, which are limited only by the scope of the appended claims.